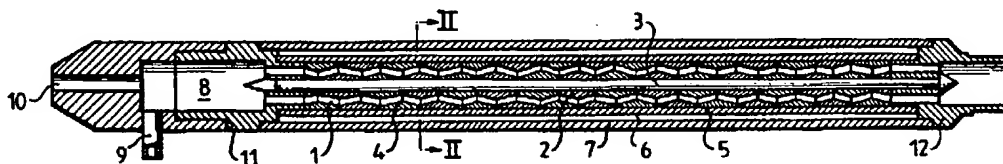


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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵: B05B 5/047, 7/14	A1	(11) International Publication Number: WO 94/27730 (43) International Publication Date: 8 December 1994 (08.12.94)
(21) International Application Number: PCT/SE93/00781 (22) International Filing Date: 29 September 1993 (29.09.93) (30) Priority Data: 9301795-2 25 May 1993 (25.05.93) SE (71) Applicant (for all designated States except US): TRINCO AB [SE/SE]; Karlavägen 21, S-567 21 Vaggeryd (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): PEHRSON, Mikael [SE/SE]; Bokvägen 6, S-360 30 Lammhult (SE). PET- TERSON, Jan-Olof [SE/SE]; Björkängsvägen 19, S-562 50 Månsarp (SE). (74) Agent: AHLPATENT AB; Förborgsgatan 27, S-554 39 Jönköping (SE).		(81) Designated States: CA, CZ, DE (Utility model), FI, JP, LV, NO, PL, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>

(54) Title: DEVICE FOR USE BY ELECTROSTATIC POWDER COATING**(57) Abstract**

The present invention is for a device for use by electrostatic powder coating. The device is intended for charging and application of powder. The device according to the invention has smaller outer dimensions than prior art devices due to a specially designed charging channel. This also makes it possible to obtain a large flow of powder and a smooth coating. The device is less subject to wear and maintenance and repair, e.g. exchange of worn parts is simple. The essential part of the invention is the mixing channel. In the embodiment shown in the figure the channel is formed by several small building elements, inner elements (2) shown in figure 4 and outer elements (4), as shown in figure 3. The building elements are held together by a central rod (3) and a surrounding outer tube (5). This in turn is surrounded by a slit (6) and an outer casing (7) shaped as an outer tube. The inlet (11) and the die (12) are also attached to the tubes (5 and 7).

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DEVICE FOR USE BY ELECTROSTATIC POWDER COATING

The present invention is for a device for use by electrostatic powder coating. The device is intended for charging and application of powder and is made as a powder spray gun which can be a separate manually operated unit or be a part of a plant and e.g. be controlled and handled by an industrial robot.

By electrstatic powder coating a flow of electrostatic charged powder particles are sprayed onto the surface which is to be coated. The surface is often a flat sheet, usually made from metal and a typical application is outside walls for refrigerators, dish washers and other household machines. Conveyance of powder through the device which is required for charging and application of the powder is by means of a gas flow, preferably pressurized air.

Several different designs of powder spray guns are known in the prior art. Swedish patent No. 8504893-2 describes a device where charging takes place in several spirally shaped charging channels having a common outlet through a die. U.S. patent No. 4,417,696 describes a device where the charging takes place in a tubular channel and in an adjacent die. The channel is made from several surrounding segments which have a charging layer on the inside delimiting a straight smooth channel. The layer and the ring elements are designed to allow leak currents.

The known devices have certain deficiencies regarding manufacture and use thereof. They are relatively large and thus take up much space and they are clumsy in handling, especially by manual work. Also their capacity is comparatively low if measured as flow of powder per time unit and the layers of powder which are obtained may have unsatisfactory smoothness, e.g. the coating may be thicker along the edges of the surfaces. The known devices are also such that the wear from the powder flowing through the device is very heavy and repair

and maintenance due to wear is complicated and costly.

The present invention is for a device for charging and application of powder by electrostatic powder coating so that the abovementioned disadvantages are avoided. The device according to the invention has smaller outer dimensions than prior art devices due to a specially designed charging channel. This also makes it possible to obtain a large flow of powder and a smooth coating. The device is subject to less wear and maintenance and repair, e.g. exchange of worn parts is simple.

The invention will be described below with reference to the annexed figures.

Figure 1 shows a cross section through the main part of a device according to the invention with a channel for charging of powder and inlet and outlet devices.

Figure 2 shows a cross section of the device of figure 1.

Figures 3 and 4 show a cross section of those elements from which the channel is built.

Figure 5 shows in the direction of the powder flow a restriction washer for use in the device in the invention.

The device shown in figure 1 has a channel 1, through which the powder is conveyed and charged. This channel has a zig-zag-shape seen in the cross section along the flow of the powder. The device is held together by a central rod 3 and surrounding casing 5 and 7. Furthermore, the invention comprises a die or outlet 12 and an inlet 11. The inlet has connections 9 and 10 for powder and pressurized air and an inlet distribution plenum 8.

The essential part of the invention is the mixing channel. In the embodiment shown in the figure the channel is formed by

several small building elements, inner elements 2 shown in figure 4 and outer elements 4, as shown in figure 3. Preferably these are made from PTFE, but also other material may be used. The elements are held together by a central rod 3 and the surrounding outer tube 5. This in turn is surrounded by a slit 6 and outer casing 7 shaped as an outer tube. The inlet 11 and the die 12 are also attached to the tubes 5 and 7. The exact shape of the building elements and their number can be varied somewhat due to the intended application. A mixing channel according to the figure 1 is obtained from fourteen outer and inner elements and in each end of the channel an end element of half length. In this way a mixing channel of a total length of about 375 mm is obtained. The outer diameter of the outer elements is less than 30 mm and the device thus has small total outer dimensions. The free opening in the mixing channel in the preferred embodiment as shown in the figure is about 4 mm. The capacity of the device is about 400 grams of powder per hour when used with pressurized air of 2 bar.

One or more restriction washers of the kind shown in figure 5 may be inserted into the mixing channel. It is convenient to make use of at least one washer which then is placed in the mixing channel at a distance from the inlet which is about $2/3$ total length of the channel. Application of the restriction washers cause a finer invariable flow and the risk for pulsating flow which otherwise exists is avoided. Depending upon the actual application one or more restriction washers may be mounted in various positions. In the inlet 11 and the die 12 there are channels with a corresponding cross section through which the powder is delivered to and from the charging channel.

A device according to the invention can within the general idea thereof be made in different embodiments and is not limited to the embodiment described above. It has already been mentioned that the exact design, the number and the material of the elements from which the channel is made may vary. Also the exact shape, number and position of the restriction washers may

vary. There may also be other supplies of air for distribution and control of the powder within or outside the channel, one purpose thereof being to prevent clogging of the channel.

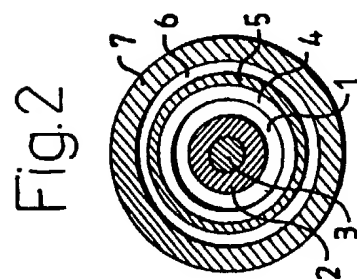
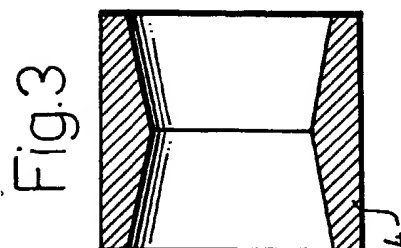
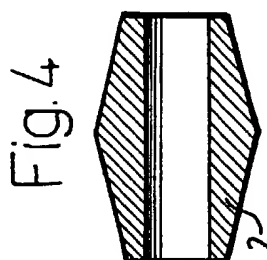
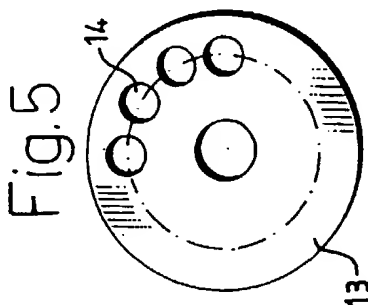
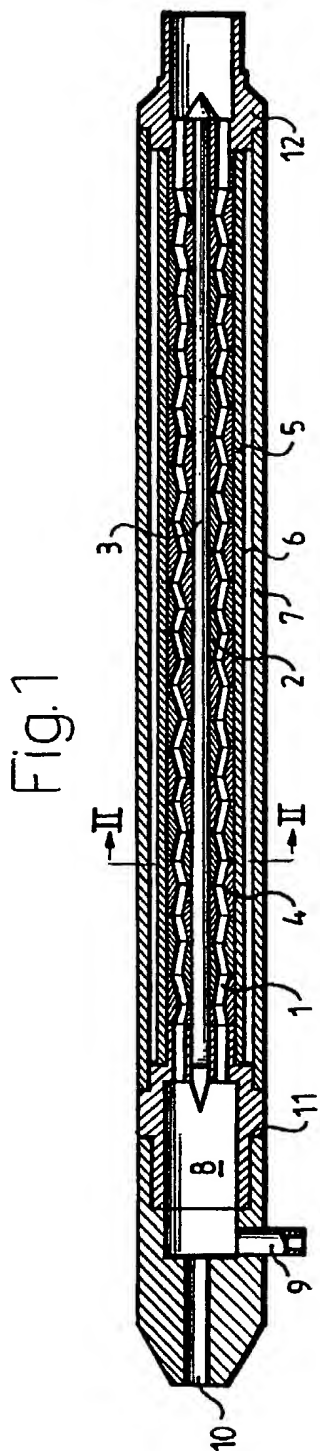
CLAIMS

1) Device for charging and application of powder by electrostatic powder coating comprising a channel (1), through which the powder is transported by means of a gas flow, characterized therein, that the cross section of the channel in the direction of the powder flow is zig-zag-shaped.

2) Device according to claim 1, characterized therein, that the channel (1) is formed as a slit between several inner (2) and outer (4) elements.

3) Device according to claim 2, characterized therein, that the elements (2, 4) are made from PTFE.

4) Device according to any of the preceding claims, characterized therein, that at least one restriction washer (13) is positioned in the channel (1).



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00781

A. CLASSIFICATION OF SUBJECT MATTER

IPC 5: B05B 5/047, B05B 7/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 5: B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4135667 (GYÖRGY BENEDEK ET AL), 23 January 1979 (23.01.79), figure 2, claim 1, abstract	4
X	WO, A1, 9211949 (JASON INDUSTRIES LIMITED), 23 July 1992 (23.07.92), page 4, line 9 - page 5, line 6, figure 2b, abstract	1-3
Y	page 4, line 9 - page 5, line 6, figure 2b, abstract	4

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT
Information on patent family members

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International application No.

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Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US-A-	4135667	23/01/79	NONE		
WO-A1-	9211949	23/07/92	WO-A-	9211950	23/07/92